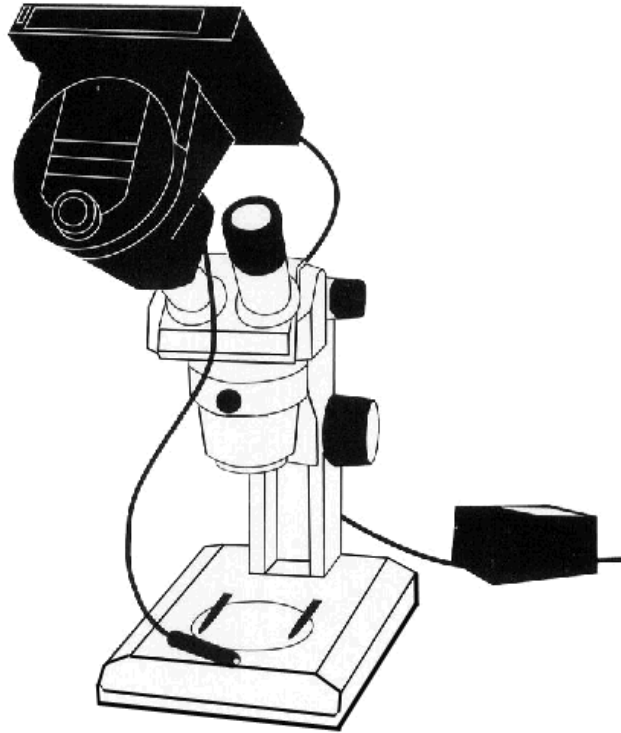
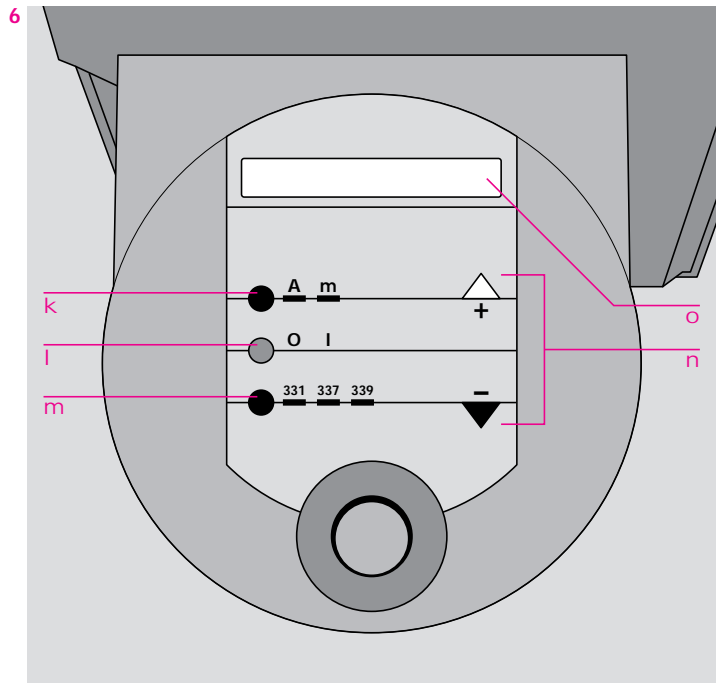
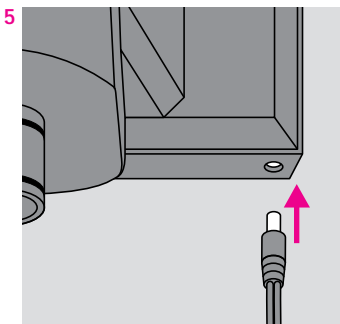
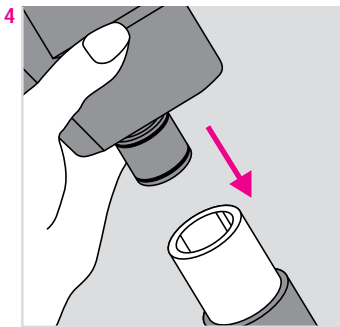
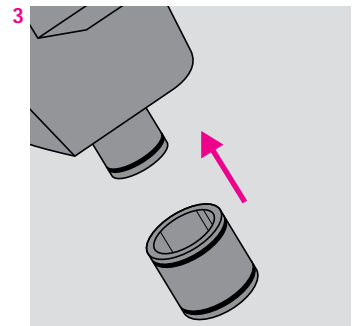
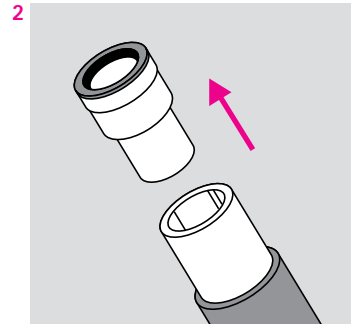
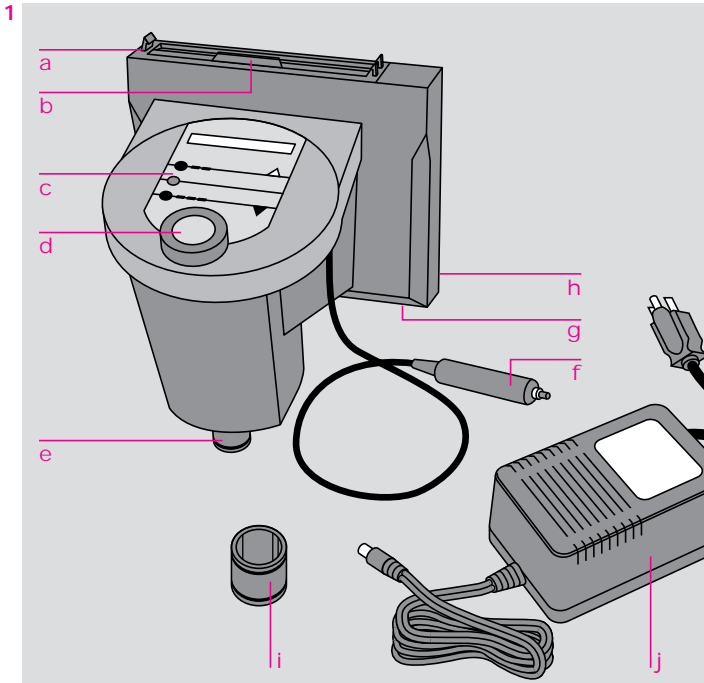


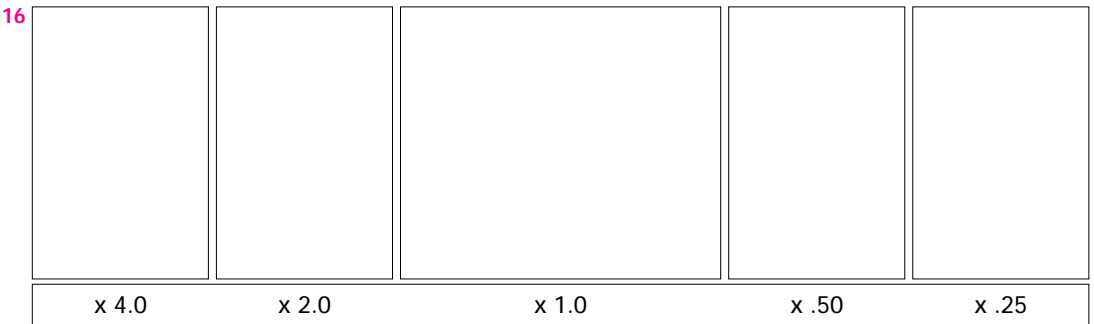
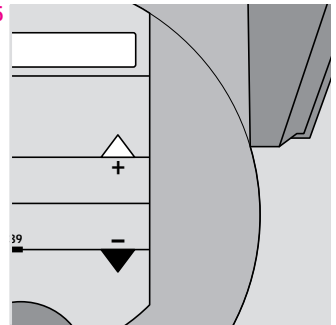
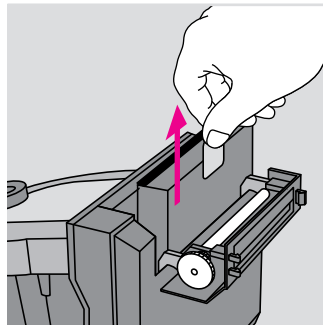
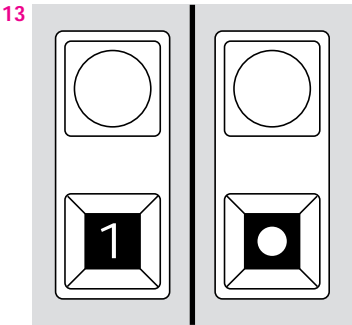
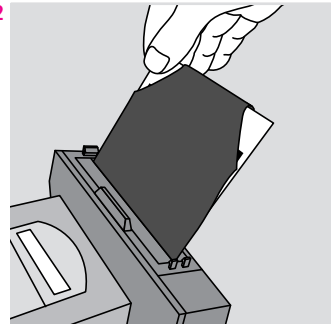
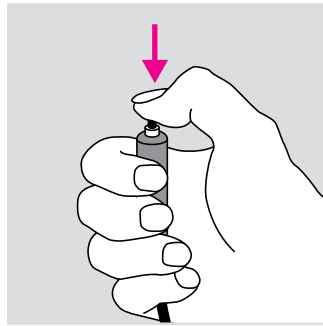
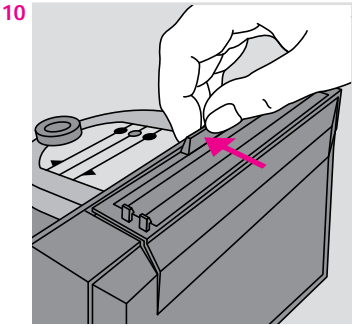
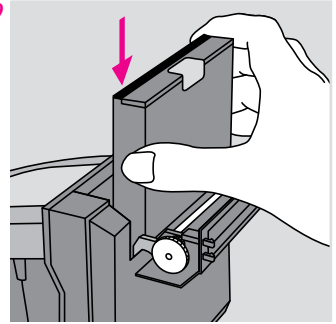
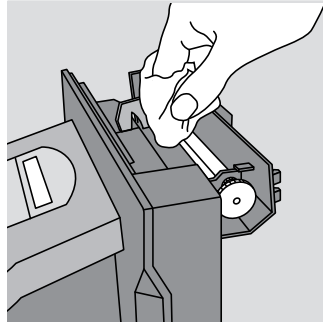
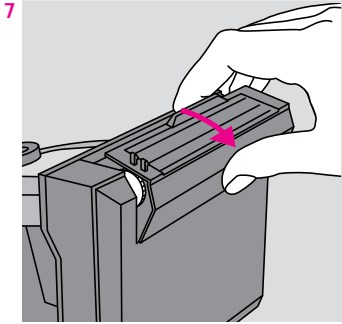
User Guide

(ENGLISH VERSION)

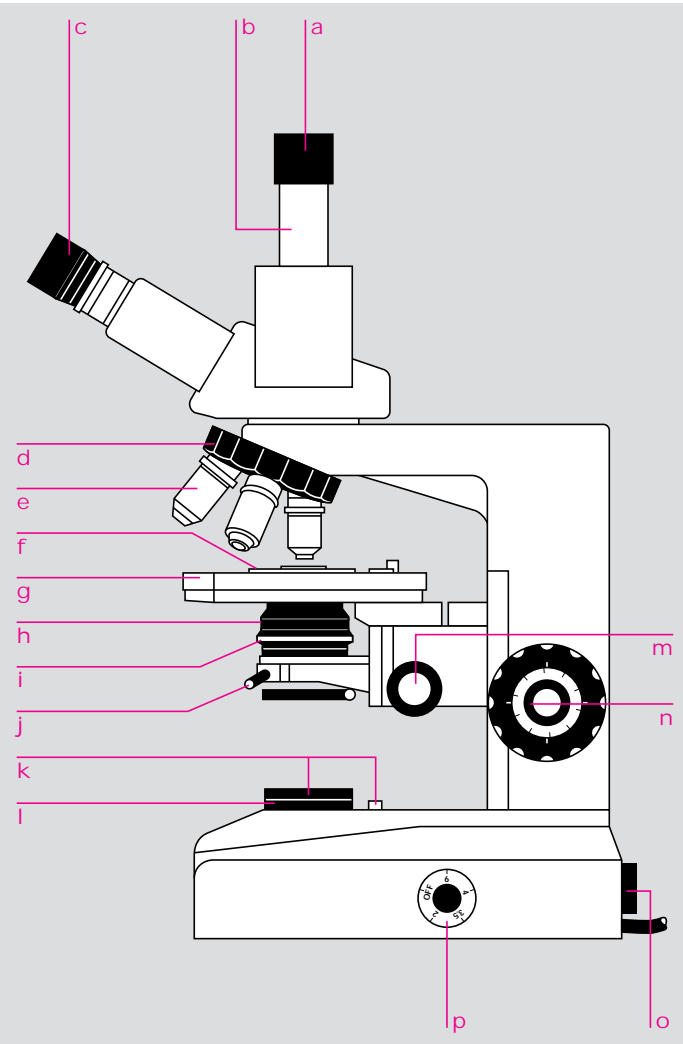
MicroCam



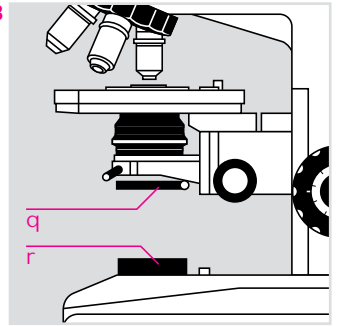




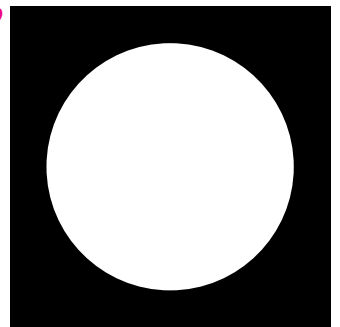
17



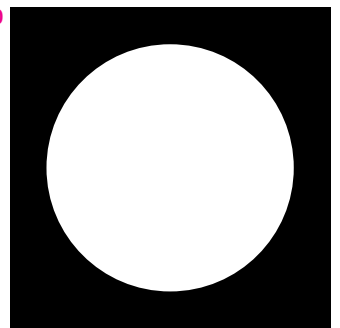
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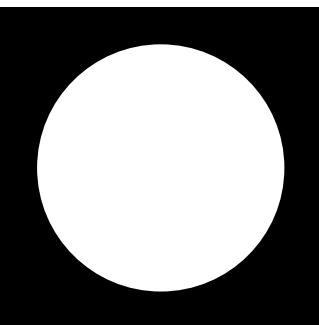
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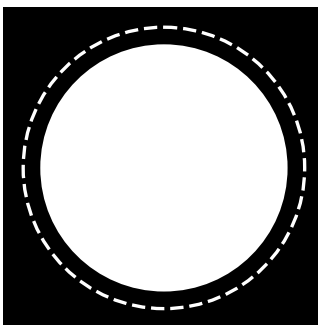
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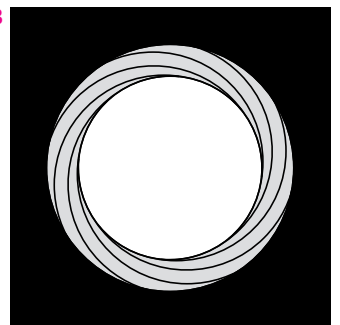
21



22



23



Introduction

The Polaroid MicroCam is designed to provide instant photographic capability to a wide variety of light microscopes. The camera is simple to operate, and is easily attached to the microscope's viewing tube, in place of the eyepiece. (Note: The camera also can be attached to the phototube, if preferred.)

The camera can make automatic exposures ranging from 1/60 sec. to 16½ minutes; it also can be set for manual operation to make longer exposures. A display on the control panel shows the camera status, and alerts you if the camera is out of film or if the illumination is too bright or too dim for an automatic exposure.

The camera uses Polaroid color and black & white AutoFilms. After exposure, the camera ejects the print, which develops automatically in normal room lighting. The pictures are fully developed in four to five minutes.

Free technical assistance

If you need additional information or assistance, call toll-free at 1-800-225-1618, Mon.-Fri., 8AM to 8PM (Eastern time). Or, write to the Polaroid Resource Center, 784 Memorial Drive, Cambridge, MA, 02139.

If outside the U.S.A., contact the nearest Polaroid Office (addresses on back page).

4 English

The numbers throughout the text refer to the illustrations at the back of the book.

The camera (Illustration 1)

- a Film holder
- b Film door latch
- c Control panel
- d Viewfinder
- e Microscope fitting
- f Remote shutter button
- g Socket for power supply
- h Film counter (on back of film holder)
- i Adapter for 29mm microscope tube

The camera fits microscope photo or viewing tubes with a diameter of 22.5mm; the adapter enables the camera to be attached to a 29mm tube.

- j Power supply

This provides power for the exposure system and film processing rollers. The camera requires a 12V 1.2 amp power supply. Insufficient power may cause the developer rollers to turn too slowly (resulting in photographs with uneven density or incomplete images); this also may cause the display and/or exposure system to function erratically. Too much power can damage the camera.

The camera is shipped with either a 120V, 60 Hz power supply (PID 618091), or a 100-240V, 50/60 Hz power supply (PID 618089). Replacement power supplies also are available: 120V, 60 Hz (PID 618092); 100-240V, 50/60 Hz (PID 618090).

The microscope

Good photomicrographs are dependent on good microscopy. Unless the microscope is properly adjusted to provide a good visual image, you cannot produce a good photomicrograph. You should be fully familiar with your microscope, and how to adjust it for photography. See pages 9-12 for basic microscope information.

Attach the camera to the microscope

The camera should be attached to the stationary (non-adjustable) viewing tube or to the photo tube, if preferred.

- 1 Remove the eyepiece from the microscope viewing tube (2).
- 2 If necessary, attach the 29mm adapter; slide the adapter **all the way over** the camera's microscope fitting (3), then screw it on.
- 3 Orient the camera as shown (4), and insert the fitting into the microscope tube. Check that the camera is firmly seated.
If the camera rotates on the tube, tighten the thumbscrew to hold it in position.
- 4 Plug the power supply into an appropriate electrical outlet and then into the camera (5).

The control panel (6)

- k Automatic/manual selector: Press to highlight the desired mode (**A**utomatic/**m**anual).
- l ON/OFF switch (O/I).
- m Film selector: Press repeatedly to highlight the correct film type (331/337/339).
- n Lighten/Darken control: This control is used to adjust the exposure before **rephotographing** the same subject. Press the white arrow Δ to increase exposure (lighten pictures), or the black arrow \blacktriangledown to decrease exposure (darken pictures). When both arrows are pressed simultaneously, the exposure returns to "normal" (x1.0). This control is not used in the manual mode.
- o Display: Shows the exposure setting and messages, as described below.

Exposure settings

When the shutter button is pressed, the display shows the exposure time and the Lighten/Darken setting:

12.0 × 1.0

This sample shows an exposure time of 12 seconds. The L/D control is set at "normal" (no adjustment).

15.0 × 1.3

In this sample, the exposure time has been increased to 15 seconds; the white arrow Δ was pressed to multiply the time by 1.3.

Messages

The camera will "beep" and display a message if it cannot operate:

339=0

The film pack is empty.

< 1/60

The microscope illumination is too bright for an automatic exposure.

> 16:30

The microscope illumination is too dim for an automatic exposure.

* .. * .. * .. * .. * .. *

The voltage is too low for proper camera operation. Check that the power supply cord is properly connected; have the line voltage tested.



A blank display indicates that there is no power to the camera. Check that the power supply is connected and that the camera is turned on. (The electrical outlet or power supply may need service.)

■ ■ ■ ■ ■ ■ ■ ■

"System error": Turn the camera off, wait about five seconds, then turn it on again.

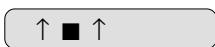
Note: The camera is shipped with the display set to show information in "symbols." It can be changed to a "word" display (in any of several languages) as follows:

Turn the camera on. Press and hold the mode (**A/m**) and film type (331/337/339) buttons simultaneously. The current language will be displayed. Press the white arrow Δ repeatedly until the desired language appears in the display. Release the mode and film type buttons.

6 English

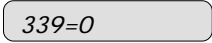
Load the film

- 1 Release the latch to open the film door (7). Check that the steel developer rollers are clean before loading the film. Clean the rollers with a soft, lint-free cloth dampened with water, if necessary (8). Rotate both rollers as you clean and inspect them. Never scrape the rollers with anything metallic, nor with your fingernail. Do not use cleaning solvents.
- 2 Hold the film pack by the edges as shown (9), and insert it into the film holder. Then push the pack all the way in. (The pack will fit only one way; do not attempt to force it into the film holder.)
- 3 Close the door (10). The display will show



Press the remote shutter button (11) to eject the dark slide. As the dark slide (or a picture) is ejected, it is covered briefly by a black shade that prevents light from

affecting the image as it starts to develop. The shade also holds the picture in the slot. Do not tamper with this delicate shade. After the dark slide (or picture) has been ejected, grasp a corner and remove it from the slot (12). The shade will snap back inside.

After the dark slide has been ejected, the film counter will show "1", indicating that the first frame is ready for exposure. When the film pack is empty, a white dot will appear (13), and  will be displayed.

To remove an empty film pack

Release the latch and open the door.

Grasp the tab on the end of the film pack and pull out the empty pack (14).

Polaroid AutoFilms

Type	Film speed	Description
339	ISO640/29°	Color print film; ideal for photographing specimens where color is needed to provide information.
331	ISO400/27°	Panchromatic, medium-contrast B&W print film; well-suited for situations where filtration for contrast enhancement is useful.
337	ISO3200/36°	High-speed panchromatic, medium-contrast B&W print film; ideal for low light situations and subjects that require filtration for contrast enhancement.

Each film pack contains 10 sheets of self-developing film.

Sheet size is 4½ x 4¼ in. (11,4 x 10,8cm); image area is 4 x 3 in. (10,2 x 7,6cm).

Note: Black & white films produce a reversed (mirror) image.

Operation

- 1 Place the specimen on the microscope focusing stage, and focus and frame the image.
- 2 Adjust the microscope illumination for photography; Koehler illumination is recommended for compound microscopes. If you are using neutral density filters over the light source when viewing, remove them before taking pictures. Check that the light is turned up to the brightest setting, often called "photo" or "overvoltage." (This setting is not suitable for viewing; overuse will shorten the bulb life.)
- 3 Attach the camera to the microscope and look through the camera viewfinder. Observe the crosshair in the center of the viewfinder while using the microscope focusing knobs to refocus the specimen if necessary.
Note: If you wear glasses to correct for distance, you should wear them when using the microscope camera.
- 4 Check the camera control settings and adjust as needed.
- 5 Press the shutter button (11). The display will show the exposure time for a few seconds, then the camera will begin the exposure. (The display will "count-down" during the exposure).

- 6 After the exposure is complete the camera will eject the developing picture. Handle the picture by its wide border. Do not bend or squeeze the picture while it develops, and never cut pictures or take them apart. See *Caution*.

Allow pictures to develop for 4-5 minutes before judging the exposure or color balance.

If the camera is unused for more than 15 minutes it turns off automatically.

Lighten/darken control (15)

A picture that is too light is overexposed; use a shorter exposure time. If the camera is set for **A**utomatic mode, press the Darken arrow ▼ to decrease the exposure time.

If a picture is too dark, it is underexposed; use a longer exposure time. Press the Lighten arrow Δ to increase the time.

The picture series (16) shows a normal exposure (x1.0), and the results of adjusting the exposure time by a factor of x4.0, x2.0, x.50 and x.25.

Exposure too short or too long

The camera will make automatic exposures as short as 1/60 second. If the microscope illumination is too bright, the camera will “beep” and the display will show:

< 1/60

Place a neutral density filter over the microscope illuminator to increase the exposure time. Do **not** turn the light down, as this will cause a color shift with color film.

Automatic exposures can be as long as 16½ minutes. If the light is too dim, the camera will “beep” and show:

> 16:30

Check that the light is turned up to the brightest setting, and that the neutral density filter (if used) has been removed. If there still is not enough light, you must make a **m**anual exposure.

Manual operation

Set the camera for manual mode. Press the shutter button to start the exposure, and watch the display as it shows the elapsed time. Press the button a second time to end the exposure.

Special exposure techniques

Exposure meter

The camera has a built-in exposure meter that is used in **A**utomatic mode. When you press the shutter button, the meter measures the light from the specimen, calculates the exposure time and then displays the time for a few seconds before beginning the exposure. You can cancel the exposure before it starts by pressing the shutter button a second time, and use the exposure indicated when making manual exposures.

Reciprocity correction

When set for **A**utomatic mode, the camera will automatically adjust the exposure time to compensate for reciprocity failure. With Type 339 color film, it also adjusts the filtration. The camera contains a built-in color conversion filter that moves into position when needed. The filter adjusts the color temperature of the tungsten/halogen microscope illuminator (2800-3400°K) to more closely match the color balance of the film (5500°K). Additional light-balancing filtration will not be necessary for most situations.

Xenon lighting

If using a Xenon (daylight) microscope illuminator with color film, set the camera for Type 331 black & white film, to remove the built-in filter. Then press the black arrow ▼ to decrease the exposure by $\times .66$ to compensate for the difference in film speed.

Dark-field illumination

The camera's automatic exposure system may produce incorrectly exposed pictures when dark-field illumination is used. The built-in exposure meter can be used to determine the correct exposure as follows:

- Set the microscope for bright-field illumination.
- Set the camera for **A**utomatic mode, and take a meter reading as described above.
- Re-set the microscope for dark-field illumination, and the camera for **m**anual mode.
- Use the exposure time indicated by the camera's meter to make a manual exposure.

Microscope information

Because of the great variety of microscopes that are compatible with the MicroCam, this booklet cannot provide specific details for all equipment. You should refer to the instructional material provided with your microscope, or contact the supplier for more information.

One of the most important microscope adjustments for photography is the illumination. The microscope illumination must meet specific criteria: The beam of light must be correctly concentrated and adjusted to provide even illumination over the entire picture area, as the camera cannot compensate for uneven lighting.

Please refer to the "universal" microscope illustration (17) for the location of microscope controls.

Note: Some older microscopes utilize optics in the eyepiece to correct for chromatic aberration. An adapter will be required to produce optimum resolution with the MicroCam. (Contact Polaroid Technical Assistance for information.)

Magnification

The final magnification of the print is approximately ten times the magnification power of the microscope's objective lens. If the exact magnification must be verified, include a scale in the photograph.

10 English

Microscope parts (17)

- a Phototube eyepiece
- b Phototube
- c Viewing eyepiece
- d Revolving nosepiece
- e Objective lens
- f Specimen
- g Specimen stage
- h Substage condenser
- i Aperture diaphragm adjustment
- j Condenser centering screws
- k Field diaphragm adjustment
- l Field diaphragm
- m Condenser focusing knob
- n Coarse and fine focusing knobs
- o Lamp
- p Lamp voltage control

Filter placement

Filters should be placed in the filter holder (18-q) if the microscope has one. Alternatively, they can be placed where the light exits from the microscope base (18-r). If the latter location is used, be sure the filters are clean and undamaged. The nearer they are to the field diaphragm, the more likely any blemishes on the filter will be focused with the specimen.

The addition of certain color filters may change the effective focus of the microscope (depending on the optical characteristics of the objective lens). After adding filters, re-focus the image before taking pictures.

Koehler illumination

Most modern compound microscopes are designed for Koehler illumination, which is ideal for photomicrography. This technique involves proper alignment of the light source, alignment and focus of the substage condenser (17-h) and field diaphragm (17-l), and adjustment of the aperture diaphragm (17-i). Koehler illumination provides even lighting and, in addition, enables the objective lens to produce optimum resolution.

Alignment and focus of the substage condenser and the field diaphragm

- 1 Place a specimen on the stage and focus it accurately. Slowly close the aperture diaphragm of the substage condenser to a point where you see a distinct reduction in brightness through the eyepiece. (See also *Adjusting the aperture diaphragm.*)
- 2 Close the field diaphragm to its smallest setting. Viewing through the eyepiece, raise or lower the substage condenser until the edge of the field diaphragm is sharply focused with the specimen image (19).
- 3 Open the field diaphragm to about 3/4 of the visual field and refocus the edge of the diaphragm, as above (20).

- 4 Align the substage condenser by centering the image of the field diaphragm, using the condenser's radial centering screws (21). If necessary, refocus the condenser once again, to keep the field diaphragm in sharp focus with the specimen image.
- 5 Open the field diaphragm until it is just outside the field of view or, for photography, until it is just beyond the area of the film format (22). Do not open it any farther, since this could cause flare and a loss in contrast.

Adjusting the aperture diaphragm

The simplest method of adjustment is to close the aperture only far enough to notice a loss of brightness. A more precise method of adjustment is to remove the eyepiece (or camera) and look down the tube. The correct setting will generally be such that the circle of light within the diaphragm blades has a diameter about $\frac{2}{3}$ to $\frac{3}{4}$ that of the entire light disc (23).

The proper setting is critical for good photomicrographs; the diaphragm should be closed down sufficiently to provide the desired image contrast, but not so far as to cause unwanted diffraction patterns that result in a loss of detail.

The light that forms the microscope image may be either direct (absorbed) or deflected (refracted/diffracted). The aperture diaphragm controls the "mix" of direct and deflected light. The correct setting is somewhat dependent on the type of specimen, and how that specimen uses direct and deflected light. For example:

- A diatom uses mainly deflected light, and not much direct light. The aperture diaphragm should be closed down to about 25%, to produce the best image.
- Stained tissue uses both direct and deflected light; an aperture diaphragm of 50% to 90% will produce a good image.
- A stained blood smear uses mainly direct light, very little deflected light. An aperture diaphragm setting anywhere between 25% and 90% will produce a good image.

Possible problems and causes

Vignetting (dark corners of print): The microscope may not be adjusted for Koehler illumination; the field diaphragm may not be opened far enough to fill the field of view.

Image sharp only in center: May be due to incorrect objective lens for photomicrography. Check that the microscope has a flat-field (also called "plan" or "plano") objective.

Also may be caused by chromatic aberration. If using an older microscope that has a correction for chromatic aberration in the eyepiece, contact Polaroid Technical Assistance for information about an adapter.

Hot spot (light) in picture: May be caused by a low-power objective lens or the field not evenly covered by the light cone. If possible, remove the front element of the condenser. A diffuser in front of the lamp (or over the field diaphragm) may help. Also, check the positioning of the lamp itself. Sometimes a rotation or a slight change in position will help uniformity.

This also may be caused by the substage diaphragm not being closed down. Close the diaphragm only until you notice a change in brightness; further closing will cause a loss of resolution.

Dirt on the condenser can also cause "hot spots."

Dirt

One of the most common causes of picture defects is dirt—on the specimen, microscope lenses or camera.

- Dirt on the microscope lenses is not always readily diagnosed. Dirt on the objective lens may result in an image that is unsharp overall and lacking in contrast. Dirt on the collector or condenser lenses will usually appear as blurred spots or specks. Dirt on the collector or field lenses will become more or less sharp with the specimen as the condenser is focused. Clean each microscope lens as recommended by the manufacturer.
- Dirt on the camera's developer rollers will produce a repeated pattern of spots or bars across the image. Clean the rollers with a soft, lint-free cloth, dampened with water. Never use cleaning solvents.
- Dirt on the mirror inside the camera will appear as well-defined spots on all prints in approximately the same location. To clean the mirror, open the camera and remove the film pack. Carefully remove specks with a clean, soft brush or cotton swab, or use compressed air.
- Dirt or dust particles on the specimen may either be in focus (and magnified) with the specimen or produce out-of-focus areas in the image. They are easily located by moving the specimen across the field of view; cleaning techniques are dependent on the type of specimen.
- Dirt on the camera lens will be visible through the viewfinder; rotate the camera slightly while looking through the viewfinder. Dirt on the lens will move as the camera is moved. This dirt will appear on pictures as out-of-focus shadows.

FCC Notice (U.S.A. only)

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications.

It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Operation of this equipment in a residential area is likely to cause interference in which case the user, at his/her own expense, will be required to take whatever measures may be required to correct the interference.

DOC Notice (Canada)

This Digital Apparatus does not exceed the Class A limits for Radio Frequency noise from Digital Apparatus set out in the Radio Interference Regulations of the Canadian Department of Commerce.

Caution

Do not cut or take apart pictures or film; a small amount of caustic paste may appear. Avoid contact and keep from children and animals. If contact is made with paste, wipe off immediately and wash with water to avoid an alkali burn.

Warranty

Your Polaroid MicroCam has been thoroughly tested and inspected before shipment. All parts are guaranteed against defects in materials and workmanship for one full year from the date of original purchase. During this period, any such defects will be remedied by Polaroid Corporation, without charge, except for transportation costs. The warranty excludes damage resulting from normal wear, mishandling or accident, and a charge will be made for such repairs.

U.S.A. only: This warranty excludes consequential damages.

Outside U.S.A.: This warranty does not affect your statutory rights.

Service

Before returning a camera for service, contact Polaroid Technical Assistance or the nearest Polaroid Office for shipping and service information. The camera should be packed in its original shipping carton or other sturdy container, and shipped, prepaid and insured, to the nearest Polaroid Office (addresses at end of book).

Polaroid Service Centers and Offices

California

Polaroid Corporation
3232 West MacArthur Boulevard
P.O. Box 25200
Santa Ana 92799-5200
Tel: (714) 641-1200

Georgia

Polaroid Corporation
5601 Fulton Industrial Blvd., S.W.
Atlanta 30378
Tel: (404) 346-1717

Illinois

Polaroid Corporation
2020 Swift Drive
Oak Brook 60521
Tel: (312) 954-1600

Massachusetts

Polaroid Corporation
Tel: Toll free 1-800-225-1618

New Jersey

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Polaroid (España)
Sucursal em Portugal
Edifício Torre dos Moinhos
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Puerto Rico

Polaroid Caribbean Corporation
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In addition to the Service Centers listed here, there are approved Service Centers within the United States as well as in many other countries. To locate the one closest to you, contact the nearest Polaroid Office, above.